Title of the Invention: A VERTICAL TERMINAL ROTARY WELDING METHOD

[Claims]

1. A vertical terminal rotary welding method, comprising the steps of:

abutting a vertical welding object with a vertical member having a height shorter than the vertical welding object so as to be arranged perpendicular to each other;

disposing torches at both side of the vertical member so as to face each other;

fillet-welding both sides of the abutted portion by the torches upwardly from below by means of MIG welding under a welding current of 140A ± 20A, welding voltage of 20V ± 2V, and a welding speed of 10cm/min ± 1cm/min;

approaching the torches to the vertical member by pushing in a plate thickness direction of the vertical member while increasing the torch speed and the welding voltage by about 10% when the torches are reached an upper end portion of the vertical member, and maintaining for a predetermined time; and

removing the torches and cutting an arc.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates a vertical terminal rotary welding method.

As shown in Fig. 1, a method comprising abutting a vertical welding object 1 with a vertical member 2 so as to be arranged perpendicular to each other and fillet-welding both sides of the abutted portion upwardly from below to be fixed is widely performed in an assembly process of heavy industries and shipbuilding, for example, in case where a beam flange which is the vertical welding object 1 is fixed to a vertical stiffener which is the vertical member 2 for a bridge truss.

In this case, the vertical fillet welding is carried out by hand welding and a welding result depends only on skill of a worker. Particularly, in an upper end portion 3 of the vertical member 2, that is, a welding terminal portion, heat is easily concentrated on an edge portion 3a during welding and the molten steel may be blown out by an arc, so that an undercut may easily formed in the edge portion 3a. The undercut gives an unfavorable

impression on an appearance, and has a problem in fatigue strength. Therefore, the worker performs upward vertical welding and then stops the welding once at the edge portion 3a and waits for a while, or must adjust the welding current again. Furthermore, during the welding of the upper end portion 3, the worker repeats the cutting and flowing of the arc, and performs the welding by dividing the arc into several passes. However, it is difficult to obtain a welded portion free of the undercut at the upper end portion 3, that is, the welding terminal portion.

The present invention is contrived in consideration of the above-described circumstance, and the object thereof is to provide a vertical terminal rotary welding method by which a welding bead having excellent appearance free of an undercut is obtained.

The vertical termination welding method characterized by comprising abutting a vertical welding object with a vertical member having a height shorter than the vertical welding object so as to be arranged perpendicular to each other; disposing torches at both side of the vertical member so as to face each other; fillet-welding both sides of the abutted portion by the torches upwardly from below by means of MIG welding under a welding current of 140A ± 20A, welding voltage of 20V ± 2V, and a welding speed of 10cm/min ± 1cm/min; approaching the torches to the vertical member by pushing in a plate thickness direction of the vertical member while increasing the torch speed and the welding voltage by about 10% when the torches are reached an upper end portion of the vertical member, and maintaining for a predetermined time; and removing the torches and cutting an arc.

Hereinafter, an embodiment of the present invention will be described for the case of using a welding robot with reference to Figs. 2 to 4.

Of a behavior of the welding robot, a behavior of a torch 4 necessary for carrying out a method of the present invention is configured so as to move as represented in Figs. 2(a) and (b). Fig. 2(a) shows a behavior of the torch in a horizontal plane when viewed Fig. 1 from the top and Fig. 2(b) shows a behavior of the torch in a vertical plane when viewed Fig. 1 from the side. Reference sign θ designates a rotation of the torch 4 in a horizontal plane and is shown with a plane of a vertical welding object 1 as a reference. Reference sign φ designates a rotation of the torch 4 in a vertical plane and is shown with a

horizontal plane as a reference. Reference sign Z designates a vertical behavior of the torch 4 and reference sign R designates a behavior in a plate thickness direction which is particular to a vertical member 2.

The welding was performed by means of MIG welding (a gas amount of 25 l/min, Ar: 80%, CO_2: 20%) by abutting a beam flange, which is the vertical welding object 1, of a bridge truss with a vertical stiffener (plate thickness: 14 mm) which is a vertical member 2 so as to be arranged perpendicular to each other and fillet-welding both sides of the abutted portion upwardly from below with a length of welding leg of 8 mm. A welding condition is that a welding current is N_A (140 A), a welding voltage is N_V (20V, normal state), and a welding speed (Z-axis direction) is 10 cm/min (normal state).

A horizontal angle θ_1 of the torch 4 upon starting the welding is 50°, and a vertical angle φ_1 is 10°. The horizontal angle θ_1 of 50° is established due to a tendency of separation for obviating the occurrence of the undercut in the vertical welding object 1 upon weaving welding. The vertical angle φ_1 of 10° is established for preventing a torch holder from being contacted with a bottom surface. In this state, the weaving is initiated by staring the arc and returning the vertical angle φ to 0° after starting. Then, the upward fillet welding is performed while weaving until the torch reaches a point A below the upper end portion 3 of the vertical member 2 by 1 mm.

The weaving is stopped upon reaching the point A. By stopping the weaving, the undercut may be formed in the edge portion 3a, but the undercut is filled in during a removal lowering process of the torch 4 described later. In order to reduce the occurrence of the undercut as little as possible, the stop position of the weaving is established to the point A below the upper end portion 3 by 1 mm.

Upon reaching a point B passing through the upper end portion 3, a raising speed of the torch 4 is increased to 40 cm/min and the welding voltage is increased to H_V (22V). Further, the horizontal angle θ of the torch 4 is changed to θ_2 (45°), and the torch are pushed in a plate thickness direction from both side by a distance R1 (7mm) which is a half of a plate thickness and maintained at a point C above the upper end portion 3 by 4 mm for a predetermined time of T_1 (2 seconds). Here, the reason for raising the welding voltage is

to prevent the generation of a recess in a surface of the vertical welding object 1. Further, by making the horizontal angle θ to θ_2 (45°), an arm part of the welding robot is prevented from being contacted to the vertical member 2 upon pushing in a plate thickness direction. Then, by approaching the torches 4, 4 to each other and maintaing for a predetermined time T1, the molten steel is collected at the upper end portion 3, that is, the welding terminal portion using attraction of the arc.

Subsequently, the torches 4, 4 are lowered while being removed by a distance R_2 which is the sum of a length of leg and a half of the plate thickness and maintained at a point D for a predetermined time T_2 (0.5 second). Then, by cutting the arc, the welding operation is terminated. As described in the above, even in case where the undercut is generated in the edge portion 3a, the undercut is filled in during the removal lowering process and a bead shape can be swelled.

By doing as such, a welding bead having excellent appearance free of an undercut can be obtained as shown in an appearance photograph of a welding termination part in an annexed reference drawing.

The vertical terminal rotary welding method of the present invention is described in the above and can obtain a welding bead having excellent appearance free of an undercut. Accordingly, a welded portion having stability higher than that of the conventional one can be efficiently obtained and productivity can be improved.

Brief Description of the Drawings

Fig. 1 is an explanatory view of a vertical fillet welding portion.

Figs. 2(a) and (b) are explanatory views showing a behavior of a torch of a welding robot in case of carrying out a method of the present invention.

Figs. 3 and 4 show one example of the method of the present invention, Fig. 3 an explanatory view of a behavior of the torch near an upper end portion (terminal portion), and Fig. 4 is an explanatory view showing an association of various behaviors of the torch and a relationship with a welding voltage.

1: Vertical welding object

2: Vertical member

3: Upper end portion